

# Appendix

- What is ITS?
- Other Resources

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## Appendix Contents:

This Appendix contains additional background material that may be helpful.

- **What is ITS?**
  - Contains material from other ITS Courses covering the basics of Intelligent Transportation Systems, and the technologies involved as they relate to transit.
- **Other resources**
  - Additional training
  - Web sites



# Intelligent Transportation Systems

## DEFINITION

*Application of advanced technologies to improve the safety and efficiency of surface transportation systems*

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**Definition of ITS** from ITS Awareness Seminar: (\*Part I, slide 3):

- "The application of advanced sensor, computer, electronics, and communications technologies and management strategies - in an integrated manner - providing traveler information - to increase the safety and efficiency of the surface transportation system."
- **ITS technologies** are the tools that enable the the sharing of information between systems and the integration of the travel modes, activities and operations.
  - With ITS, lots of information is exchanged, communicated and managed.
- This information is brought to the user through the use of various equipment:

*cellular phones	*computers	*E-Mail
*World Wide Web	*GPS bus antenna	*CCTV cameras
*modems	*inbedded/overhead loops (detectors)	



## Using Information & Communications Technologies to Better Manage Transportation



**Intelligent Transportation Systems employ information and communications technology-based systems, and are being implemented now across the nation**

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How ITS is currently being used:

- Just as the Air Traffic Control system used technology to increase capacity, surface transportation is now employing Intelligent Transportation Systems locally, statewide, and regionally to meet the growing demands on the surface transportation infrastructure.



## ITS Focus Areas

- Metropolitan ITS Infrastructure
- Rural ITS
- Commercial Vehicle Operations (CVO)
- Intelligent Vehicle Initiative (IVI)

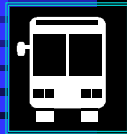
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The four areas that ITS is currently focusing on:

- **Metropolitan ITS Infrastructure:** This area will be detailed on the following slides since it is the largest area that affects many people. This is an intermodal focus.
- **Rural ITS:** the APTS Program is now targeting deployment and research opportunities to include the Advanced Rural Transportation Systems (ARTS). The component systems in the metropolitan areas can be applied in one form or another to rural as well as urban areas. But integration is different for rural areas which have their own challenges that ITS is helping to solve, including:
  - Welfare to work programs
  - National parks programs
- **Commercial Vehicle Operations (CVO):** Trucks. This doesn't directly impact transit, but is a well-developed piece of the Architecture.
- **Intelligent Vehicle Initiative (IVI):** The Transit interest in this area is focusing on safety and collision avoidance. Safety can affect insurance costs.
  - e.g. driver "tripper" warning systems on buses that are used in metropolitan areas to drive kids to school. Kids can't be seen, but a warning system that detects them in front of the bus can improve safety. TEA-21 calls for a study.



# Metropolitan ITS Infrastructure



**Transit  
Fleet  
Management**



**Regional  
Multimodal  
Traveler  
Information**



**Electronic  
Fare  
Payment**



**Freeway  
Management**



**Electronic  
Toll  
Collection**



**Emergency  
Management**



**Traffic  
Signal  
Control**



**Incident  
Management**



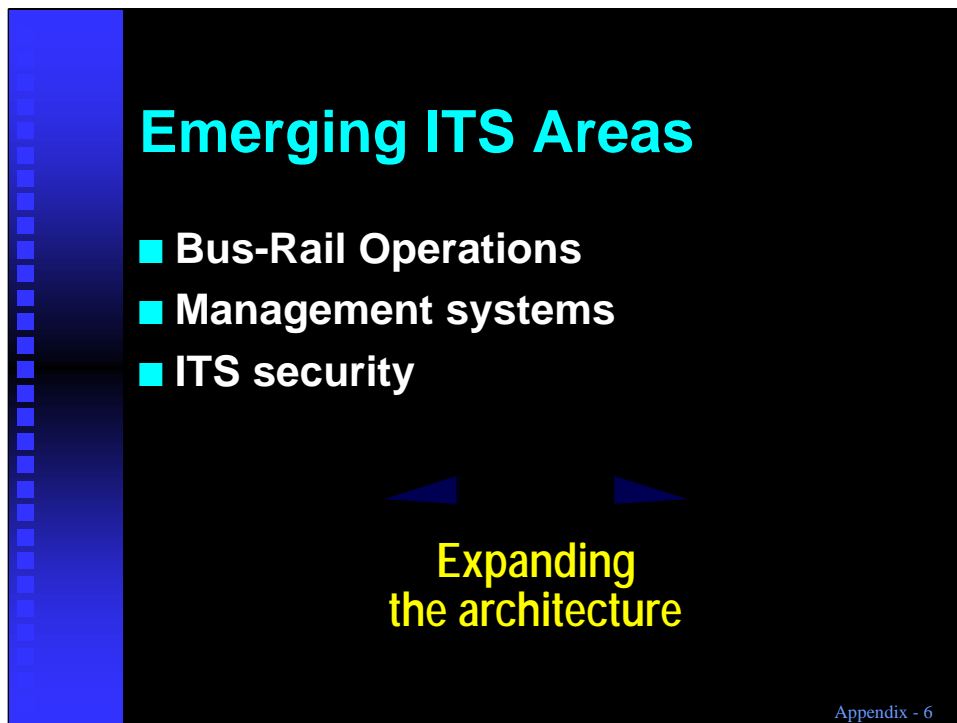
**Highway-Rail  
Intersection  
Safety**

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The Metropolitan ITS Infrastructure services:

- **Transit Fleet Management** includes enhanced passenger information, automated data and fare collection, vehicle diagnostics systems, and vehicle positioning technologies, all enabling more efficient transit operations.
- **Regional Multimodal Traveler Information** is a centralized repository, or linked information network, of comprehensive transportation data that directly receives roadway and transit system monitoring and detection information from a variety of sources.
- **Electronic (Regional) Fare Payment** is a system that uses multi-use traveler debit or credit cards that eliminate the need for customers to provide exact fare (change) or any cash during the transaction.
- **Freeway Management** provides transportation managers the capability to monitor traffic and environmental conditions on the freeway system, identify flow impediments, implement control and management strategies, and disseminate critical info to travelers.
- **Traffic Signal Control** monitor traffic volume and automatically adjust the signal timing plans to optimize traffic patterns, including signal coordination and prioritization.
- **Electronic Toll Collection** is a payment system for toll collection via driver payment cards or vehicle tags (transponders), thus decreasing delays and improving roadway throughput.
- **Incident Management Program** is an organized and functioning system for quickly identifying and responding to incidents (crashes, breakdowns, cargo spills) that occur on freeways or major arteries.
- **Emergency Management** focuses on safety, including giving emergency response providers the ability to quickly ascertain the exact location of an incident (crash or breakdown), locating the nearest emergency vehicle, providing route guidance to the scene, and communicating from the scene to hospital.
- **Highway-Rail Intersection Safety** (Railroad Grade Crossing Warning System) - At railroad grade crossings, train movements are coordinated with traffic signals and drivers will have in-vehicle warning systems to alert them of approaching trains.





In addition to the continued deployment of technologies that have proven beneficial to transit systems and on-going research and testing of other ITS applications, such as HOV Lane Control technologies, the future includes:

- **Rail-Bus Operations**
- **Internal fleet management systems:** vendors are starting to get involved in this area, turnkey systems, marrying software systems with technologies.
- **ITS Security**
- **Expanding the architecture:**
  - The architecture is not a static tool. They have expanded the architecture already, and will continue to maintain the architecture through TEA-21 funding.
  - E.g., a need arose in the Planning community that was not in the architecture at first, but now is -- the Archive Data User Service.



# Intelligent Transportation Systems Services

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The **9 pieces of the metropolitan ITS services** (which are just one way to group the services that ITS provides) are like pieces of a puzzle.

- Each piece is seemingly standalone, but...

MORE ON NEXT PAGE.



## Integration magnifies benefits and builds a foundation for the future



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Integrating these ITS services by linking the information and data flows with one another provides an opportunity to magnify the benefits of ITS, e.g.:

- Integration enables Emergency Response and Incident Management services to know of a crash at virtually the same time it is detected by freeway management.
- Traffic Signal Control, Traveler Information, and Transit Management services can also take real-time actions to mitigate a crash's impact on traffic and their customers by alerting motorists and offering rerouting alternatives.

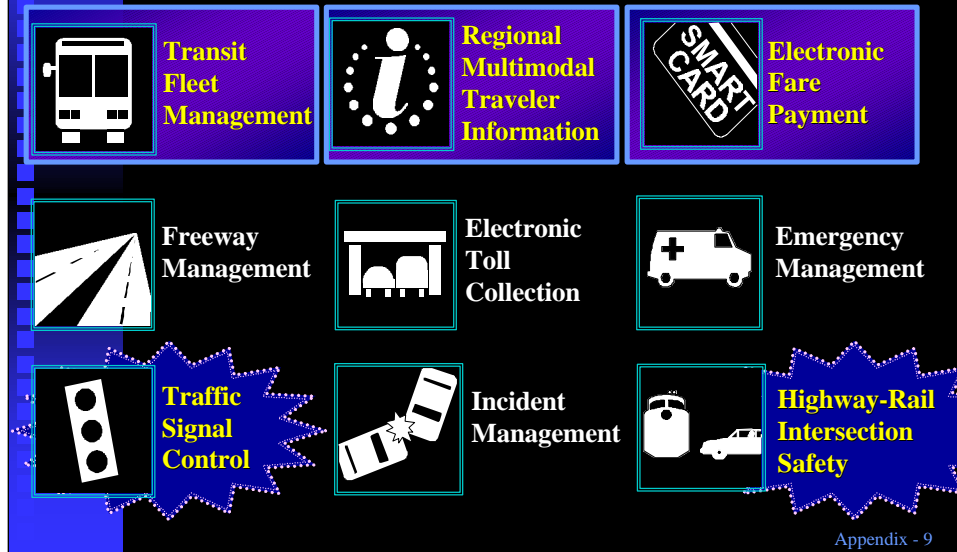


It must be emphasized that while significant benefits are derived from each of these nine components, even greater benefits can be shown when these features are integrated and operated in a coordinated fashion throughout the metropolitan area or region.





# Metropolitan ITS Infrastructure



The Metropolitan ITS Infrastructure components at the top of the slide are directly related to transit. Agencies around the country are currently working in these areas:

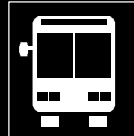
- **Transit Management System**
- **Regional Multimodal Traveler Information System**
- **Electronic (Regional) Fare Payment**

The remaining areas ALL have a transit component; e.g., some buses are being equipped with toll tags.

- The appendix looks at the top three areas as well as two of the more popular areas indirectly related to transit that currently have systems that are providing information to transit agencies as part of an integrated regional system.
  - **Traffic Signal Control Systems**
  - **Highway-Rail Intersection Safety Systems**



# Transit Fleet Management

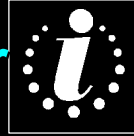


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**Transit Fleet Management Systems:** the software and hardware systems that improve the efficiency of transit fleet management (includes ATIS, AVL, AVM, automated software systems, etc.)



# Regional Multimodal Traveler Information



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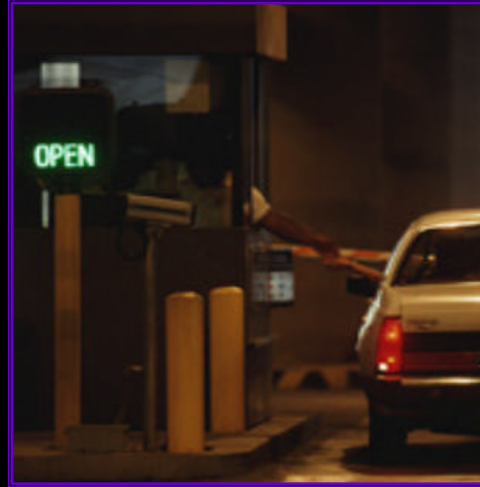
## Regional Multimodal Traveler Information Systems:

Traveler Information can let people know what's ahead so they can accurately predict their trip time - can especially be important for just in time deliveries.

- *En-route Traveler Information* accessed via:
  - In-vehicle units and AM/FM radio
  - Kiosks at rest areas
  - Watches that receive and display information
  - Cell phone
  - Handheld personal communication device
- *Pre-Trip Traveler Information* accessed via:
  - cable TV
  - interactive TV
  - Internet



# Electronic Fare Payment



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**Electronic (Regional) Fare Payment Systems** offer convenient methods for payment of fares and other transportation needs.

*Examples shown on slide:*

- Paying with a charge card to ride a bus in Atlanta
- Using an electronic card to pay at a toll booth



# Traffic Signal Control



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**Traffic Signal Control Systems** monitor traffic volume and automatically adjust the signal timing plans to optimize traffic patterns (flows). This includes signal coordination and vehicle prioritization.





# Highway-Rail Intersection Safety



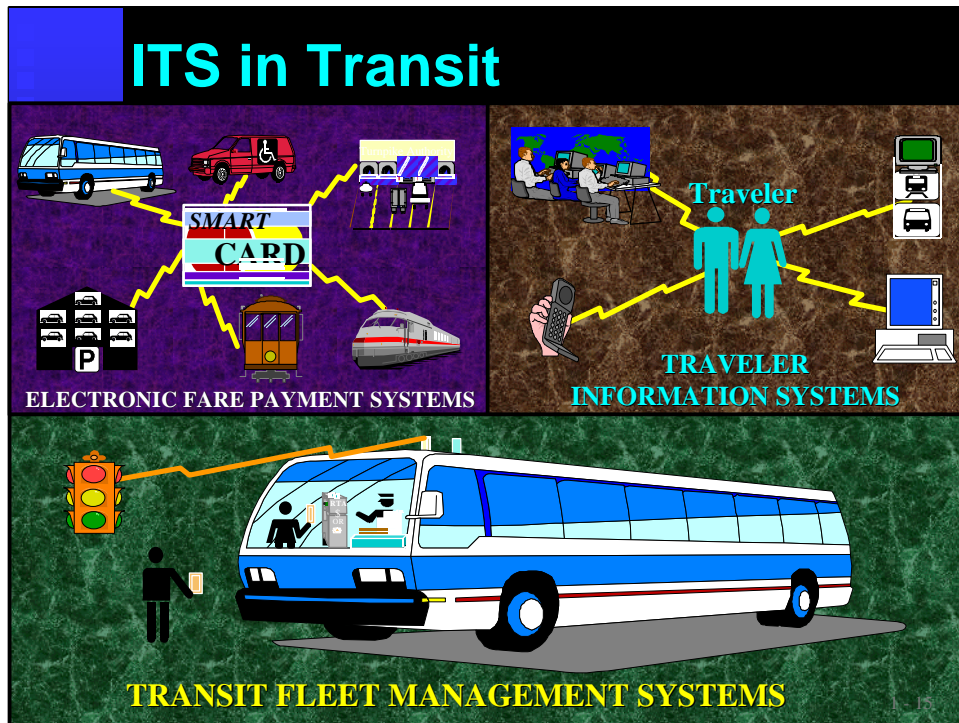
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## Highway-Rail Intersection Safety Systems:

While this is not directly related to transit, integration of information could be useful to transit:

- ITS can also warn train operators of automobiles or any objects obstructing their path.
  - It is important that trains receive such information quickly since it takes a heavy train a few miles to stop.
- This research and technology will benefit not only rail freight and intercity passenger service (Amtrak), but also Commuter Rail, Heavy Rail and Light Rail operations within metropolitan areas.





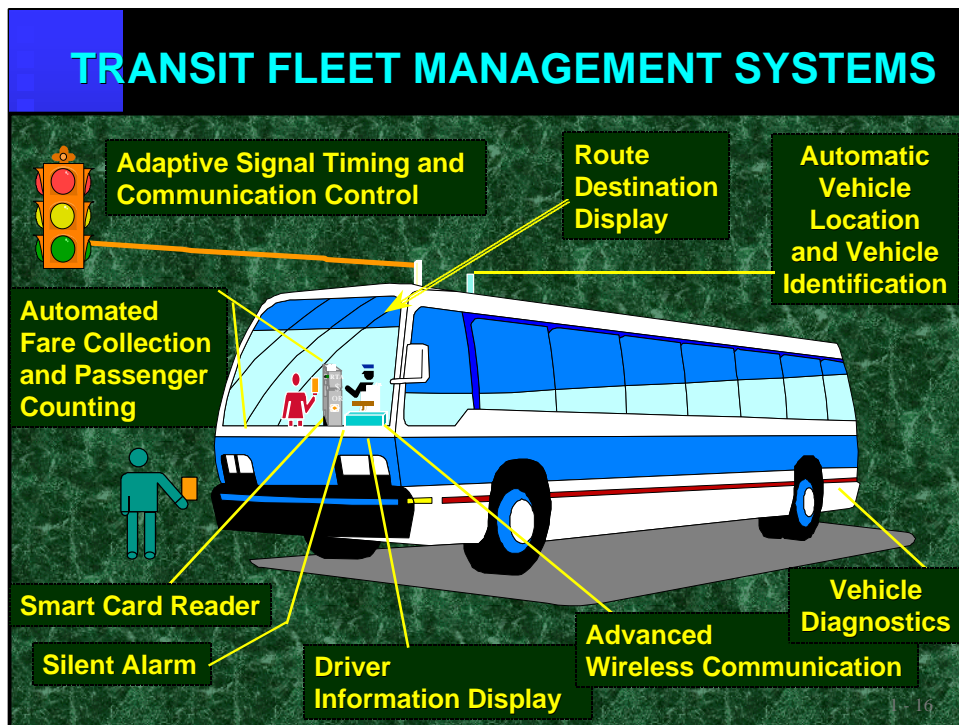
The next three slides will examine some of the technologies that are currently being deployed in the field in the three transit areas directly related to transit.

- **Electronic Fare Payment Systems**
- **Traveler Information Systems**
- **Transit Fleet Management Systems**

Within each component exists a variety of advanced technologies.

- APTS actually gets very specific about these technologies and groups them into detailed advanced technology categories.
- You can get more information about that from the *ITS in Transit* seminar or the *Transit Management* course.



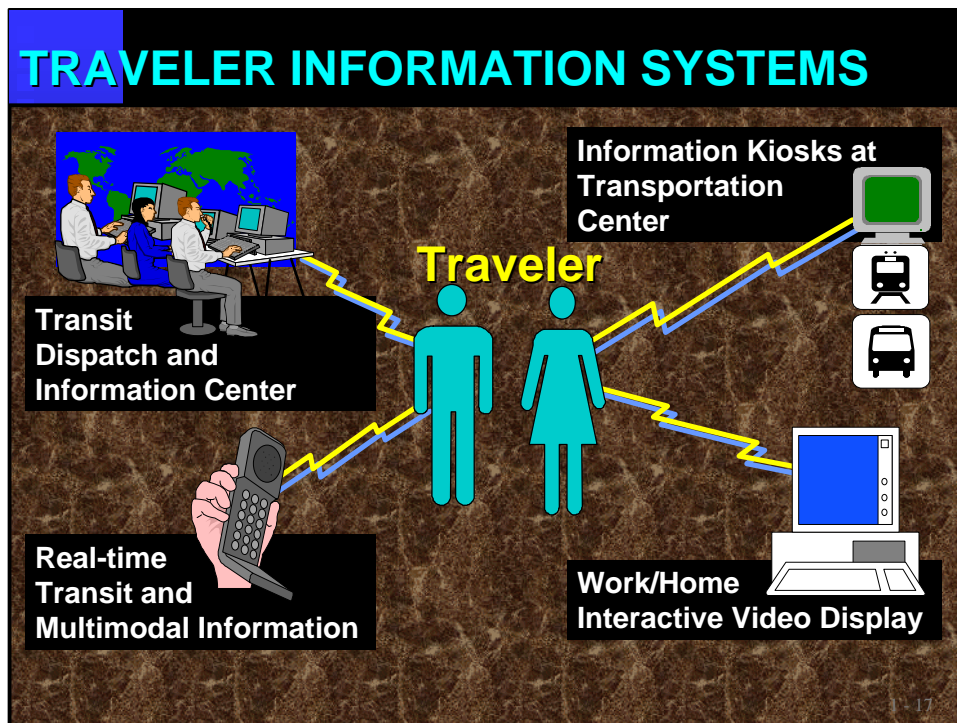


**Transit (Fleet) Management Systems** encompass technologies that are used from the time the vehicle is pulled out for service in the morning to when the passenger enters the vehicle, all day when the vehicle is in operation, to when the vehicle is pulled into the service bay at night.

- Whereas fare payment systems and transit information technologies benefit the customer, the primary focus of transit management systems is on vehicle controls and monitoring, directly benefiting the transportation service provider, with indirect benefits to the traveler.
- The slide shows a number of the technologies available.



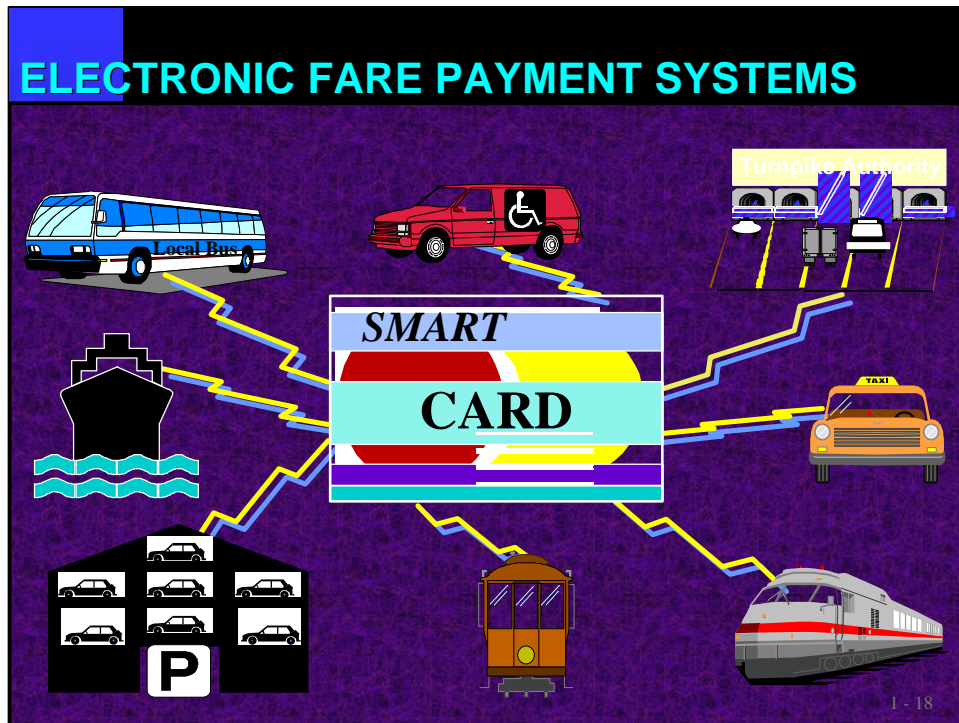




#### Advanced Traveler Information Systems (ATIS):

- This component is centered around the objective of providing the customer the greatest level of information possible, utilizing all means possible, including:
  - In-vehicle annunciators/displays
  - Terminal or wayside based information centers
  - Information kiosks
  - Variable Message Signs (VMS)
  - Telephone information systems
  - Cable and interactive TV
  - The Internet and e-mail communication
- All of these means are potentially connected to the customer through staff and equipment located at the Transit Dispatch and Information Centers.





Electronic Fare Payment (and Smart Card) multimodal applications, include:

- Transit (bus, light rail, heavy rail, commuter rail)
- Paratransit (many times has a collection system different from fixed-route services)
- Taxis
- Parking (initially at transportation centers, park-and-rides)
- Highway Tolls
- Ferries

While these applications are all transportation oriented, future uses of the "Smart Card" could be for shopping, like a credit card.

- Some credit card companies are examining the expansion of their card services to include fare/toll capabilities.



## Other Resources

- PCB Training
- Web Sites

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### PCB Training:

The following courses, among others, are currently being offered under the PCB Program. For more information, contact your FTA Region office, your local FHWA division, or visit the web site for PCB classes being offered by NHI and to download the PCB Course Catalog. *(1 Day courses unless noted otherwise).*

- Intelligent Transportation Systems Public/Private Partnerships
- Intelligent Transportation Systems (ITS) Awareness Seminar
- Intelligent Transportation Systems and the Transportation Planning Process
- Intelligent Transportation Systems Telecommunications Overview
- ITS Telecommunications Analysis
- ITS in Transit
- Shared Resources for Telecommunications
- Transit Management Course *(2 day)*
- Using the National ITS Architecture for Deployment (Private sector-3 day, Public sector-2 day)
- Deploying Integrated Intelligent Transportation Systems(ITS) *(3 day)*

### Web Sites:

- Case Studies & architecture guidance: <http://www.its.dot.gov>
- FTA: <http://www.fta.dot.gov>
- FHWA : <http://www.fhwa.dot.gov>

